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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 10/814,167
Filing Date: April 01, 2004
Appellant(s): CARREA, ELISABETTA

Adam J. Cermak
(Reg. No. 40,391)

For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed **09/06/2007** appealing from the Office action mailed **12/08/2006**.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

US 5,724,805	GLOMB et al	03-1998
US 5,154,599	WUNNING	10-1992
JP 10-89614	NIPPON FURNACE KOGYO	04-1998
US 6,497,098	GRIFFIN et al	12-2002

US 5,636977 BENSON et al 06-1997

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which the subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims: Rejected under 35 U.S.C. 103(a)

Claims **1, 2, 4, 5-10, 22-25** and **28** are rejected under 35 U.S.C. 103(a) as being unpatentable over **US005724805 (Glomb et al)** (of record) in view of **US005154599 (Wunning).**

US005724805 (Glomb et al) show and disclose a gas turbine electric power generation and combustion process including:

- forming a substantially nitrogen-free gas mixture from oxidant, fuel (natural gas), and inert gas (CO_2); and
- wherein the gas mixture comprises mixing the fuel or a mixture of fuel and inert gas at least at two locations (16, 18a, 19) in the burner arranged sequentially relative to a through-flow direction of the burner;
- combusting the mixture in a gas turbine power generation system.

In this regard **US005724805 (Glomb et al)** discloses the following:

> 10) FIG. 1 shows the overall design of a natural gas-fired power plant according to the invention. As shown in FIG. 1, air is separated in the **AS/CC unit** into liquid O.sub.2,

gaseous N.sub.2, and argon (Ar). The gaseous N.sub.2 can be either vented into the atmosphere or sold as a by-product. The argon is produced as a by-product. The liquid O.sub.2 is compressed, e.g., to 17 bar, then sent to the CO.sub.2 liquefier to be evaporated while condensing the gaseous CO.sub.2. The evaporated **O.sub.2 is then sent to the combustor of the gas turbine.** The combustion products are essentially CO.sub.2 and H.sub.2 O, which are used to generate power in the **gas turbine**.

(70) It is also noted that this plant, fired either by **pure NG or SG**, produces no nitrogen oxides (NO.sub.x). **Since NG or SG are combusted in almost pure oxygen (99.5+% pure),** there is no opportunity to form NO.sub.x in the combustor. CHEMKIN computer code calculations confirm that the concentration of NO.sub.x will be only in the tens of parts per million by volume (ppmV) in the flue gas when NG or SG are combusted in 99.5 percent oxygen and 0.5 percent nitrogen. Preferably this number is less than 100 ppmV of NO.sub.x. (Highlighting and Underlining Added)

(93) When a sufficient amount of CO.sub.2 for the working fluid has accumulated, **the plant will continuously recycle about 95 percent of the total CO.sub.2 recovered from the exhaust gas**. This total amount of CO.sub.2 includes previously recycled CO.sub.2 and CO.sub.2 newly produced by combustion. **In this steady state operation,** about 5 percent of the total CO.sub.2 recovered is liquefied and removed from the plant. This constitutes an amount of CO.sub.2 equal to 100 percent of the CO.sub.2 newly produced by combustion in the plant.

(94) **Once operating under steady state conditions,** the plant described above will generate 210 MW of electricity and 51 tonnes of process stream per hour, and will also produce saleable by-products, including 9878 tonnes of nitrogen, 162 tonnes or argon and 2102 tonnes of liquid carbon dioxide per day. Considering the fact that the plant produces these valuable by-products, it is highly profitable besides being environmentally "clean." The novel concepts and techniques described above, namely the integrated AS/CC unit and the CEM, push the net power efficiency of the NG-fired plant to 45% and that of the gasified coal-fired or SG-fired plant to 36.6%. The net efficiency reaches 47% when LNG is used instead of NG.

(95) The efficiency losses due to CO.sub.2 recovery are relatively modest when one considers the environmental gains of nearly 100% CO.sub.2 recovery, no sulfur oxides, no nitrogen oxides, and no particulate emissions. Furthermore, the new plants produce saleable by-products, which makes them economically competitive with advanced conventional power plants.
(Highlighting and Underlining Added)

US005724805 (Glomb et al) shows and discloses the invention substantially as set forth in the claims with possible exception to the combustion occurring as flameless combustion.

US005154599 (Wunning) explicitly discloses and teaches, from applicant's same NOx gas reducing burner field of endeavor, the "... ***NOx values occurring in flameless oxidation are***

*lowered to **far below** the values that would occur if the fuel were combusted with flames without preheating of the combustion air".* (Highlighting and Underlining Added)

US005154599 (Wunning) the exhaust gas guidance device comprises a cross-sectional expansion (at 11).

US005154599 (Wunning) discloses the following:

> (18) This method operates with an extremely high rate of exhaust gas recirculation (r.gtoreq.2), so that even with complete air preheating (.epsilon.=1), the maximum temperatures (1500.degree. C.) that occur upon oxidation are lower than in the case of combustion of the fuel in flames. Despite high air preheating and thus optimal exploitation of the exhaust gas heat, **the NOx values occurring in flameless oxidation are lowered to far below the values that would occur if the fuel were combusted with flames without preheating of the combustion air.** Thus the novel method has virtually overcome the previously existing conflict between the goals of energy economy from air preheating and the most extensive possible avoidance of the formation of nitrogen oxides. Moreover, as experience has confirmed, the noise level in the combustion chamber is drastically reduced in the novel method compared with the noise produced in combustion with flames, because the pressure fluctuations in the flame front that are definitive for noise production are omitted.

(Underlining and Highlighting Added)

In regard to claims **1, 2, 4, 6-10, 22, 23** and **28**, for the purpose of lowering the NOx values, it would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combustor of **US005724805 (Glomb et al)** to operate under flameless oxidation conditions by preheating the oxidant and retaining and re-circulating a part of the exhaust gases in the combustion chamber gas, defined by a guidance device comprises a cross-sectional expansion. In regard to claims **5** and **24**, since the required volume ratio of inert gas and oxygen for a given combustion system would necessarily depend on a variety of design concerns and/or parameters, such as the over all shape and size of the apparatus, the type and amount of fuel used, etc., to form or operate **US005724805 (Glomb et al)** in accordance with the limitations set forth in these claims can be viewed as nothing more that merely matters of choice in design, absent the showing of any new or unexpected results produced therefrom over the prior art of record.

Claims: Rejected under 35 U.S.C. 103(a)

Claims **3, 12, 13, 14, 16, 20, 21,** and **25** are rejected under 35 U.S.C. 103(a) as being unpatentable over **US005724805 (Glomb et al)** (of record) in view of **US005154599 (Wunning),** as applied above, and further in view of **JP10-89614.**

JP10-89614 (see the English language Abstract) teaches that, in a low nitrogen oxide gas forming combustion system including flue gas recirculation, it would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to, for at least the purpose of eliminating the use of a pilot burner, preheat the combustible mixture to a temperature greater than the spontaneous ignition temperature, or self-ignition temperature.

In regard to claims **3, 12, 13, 14, 20, 21** and **25**, for at least the purpose of eliminating the use of a pilot burner, it would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify **US005724805 (Glomb et al)** to preheat the combustible mixture to a temperature greater than the spontaneous ignition temperature, or self-ignition temperature.

Claims: Rejected under 35 U.S.C. 103(a)

Claims **11** and **15** are rejected under 35 U.S.C. 103(a) as being unpatentable over **US005724805 (Glomb et al)** (of record) in view of **US005154599 (Wunning)** (of record) and **JP10-89614**, as applied above, and further in view of **US006497098 (Griffin et al).**

US005724805 (Glomb et al) shows and discloses the invention substantially as set forth in the claims with possible exception to:

- precombusting a partial quantity of the oxygen and a partial quantity of the fuel to increase the mixture temperature in the burner, to increase the exhaust gas proportion in the gas mixture before a main combustion space, or both, said precombusting being catalytically initiated, stabilized, or both including a static mixer, or swirler and one or more catalyzer elements.

US006497098 (Griffin et al) teaches, form applicant's same reduced NOx combustion field of endeavor, a combustion system and process including:

- forming a gas mixture (at 30) from oxidant and inert gas (29) and fuel (31);
- wherein the oxidant comprises substantially pure oxygen or a mixture of substantially pure oxygen;
- forming with a mixture of substantially pure oxygen and inert gas, including extracting oxygen with an oxygen transport membrane (9) from an oxygen-containing gas mixture arranged on a retentate side of the membrane, and transporting the extracted oxygen to a permeate side of the membrane, and removing the transported oxygen by scavenging with the inert gas; and
- precombusting a partial quantity of the oxygen and a partial quantity of the fuel to increase the mixture temperature in the burner, to increase the exhaust gas proportion in the gas mixture before a main combustion space, or both, said precombusting being catalytically initiated, stabilized, or both (see figures 4-5) including a static mixer, or swirler (77) and one or more catalyzer elements (79, 80).

In this regard **US006497098 (Griffin et al)** discloses the following:

> (16) It is useful that the catalyzer element 79 located upstream with respect to the flow through the burner 2 or the heat exchanger/burner unit 36 consists of a catalyzer material that is more active than that of the catalyzer element 80 located downstream. It is also useful that the downstream catalyzer element 80 is produced from a thermally more stable material than the upstream catalyzer element 79. While the **upstream catalyzer element 79** therefore is particularly suitable for an **initiation of the combustion**, the **downstream catalyzer element 80** can be used particularly well for **stabilizing the combustion**. If there are more than two catalyzer elements 79, 80, one or more upstream catalyzer elements 79 accordingly may be more active and/or one or more downstream catalyzer elements 80 may be more stable.
>
> (17) The catalyzer 78 is followed by a stabilization zone 81 that brings about an aerodynamic stabilization of the homogeneous reaction zone. Downstream from this stabilization zone 81 is a burn-out zone 82, in which the homogeneous reaction can be completed.

(Highlighting and Underlining Added)

In regard to claims **11** and **15**, for the purpose of forming an aerodynamic stabilization of the homogeneous reaction zone, it would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combustor of **US005724805 (Glomb et al)** to include means for precombusting a partial quantity of the oxygen and a partial quantity of the fuel to increase the mixture temperature in the burner, to increase the exhaust gas proportion in the gas mixture before a main combustion space, or both, said precombusting being catalytically

initiated, stabilized, or both including a static mixer, or swirler and one or more catalyzer elements, in view of the teaching of **US006497098 (Griffin et al).**

Claims: Rejected under 35 U.S.C. 103(a)

Claims **17-19** are rejected under 35 U.S.C. 103(a) as being unpatentable over **US005724805 (Glomb et al)** (of record) in view of **US005154599 (Wunning)** (of record) and **JP10-89614** and **US006497098 (Griffin et al),** as applied above, and further in view of **US005636977 (Benson et al).**

US005636977 (Benson et al) shows and disclose a combustion process comprising:

- forming a gas mixture from oxidant, fuel, and inert gas (20);
- wherein the oxidant comprises substantially pure oxygen or a mixture of substantially pure oxygen (see column 3, lines 18-25);
- wherein forming the gas mixture comprises mixing the fuel or a mixture of fuel and inert gas at least at two locations (20, 25; 30, 35, 40) in a burner arranged sequentially relative to a through-flow direction of the burner;
- a mixture forming device configured and arranged for the formation of a substantially nitrogen-free gas (the amount of nitrogen being substantially reduced due to the use of pure oxygen) mixture of oxidant, fuel, and inert gas (e.g. – CO_2), and having a burner configured and arranged for carrying out combustion, the mixture forming device configured and arranged to bring oxygen and fuel together in the burner first to form a gas mixture having a temperature above the self-ignition temperature of the gas mixture;
- an internal exhaust gas recirculation system (40); and
- an external exhaust gas recirculation (see as labeled in figure 1).

In regard to claims **17, 18** and **19**, for the purpose of further aiding in the reduction of NOx gas formation, it would have been obvious to a person having ordinary skill in the art to modify **US005724805 (Glomb et al)**, wherein forming the gas mixture comprises mixing the fuel or a mixture of fuel and inert gas at least at two locations in a burner arranged sequentially relative to a through-flow direction of the burner, in view of the teaching of **US005636977 (Benson et al).**

(10) Response to Argument

In the Section titled "ARGUMENTS" and under the heading "Introduction" Appellant states that the following rejections were made in error:

- Claims 1, 2, 4-10, 22-25, and 28 rejected under section 103(a) over U.S. Patent No. 5,724,805, issued to Golomb et al. ("Golomb") in view of that from U.S. Patent No. 5,154,599, issued to Wunning.
- Claims 3, 12-14, 16, 20, 21, and 25 were rejected under section 103(a) over Golomb and Wunning, and further in view of that from Japanese patent document number 10-89614 ("JP-614").
- Claims 11 and 15 were rejected under section 103(a) over Golomb, Wunning, and JP-614, and further in view of U.S. Patent No. 6,497,098, issued to Griffin et al. ("Griffin").
- Claims 17-19 were rejected under section 103(a) over Golomb, Wunning, JP-614, and Griffin, and further in view of those of U.S. Patent No. 5,636,977, issued to Benson et al. ("Benson").

In this same section of Appellant's Brief Appellant states the following with regard to claims 1 and 12:

"Independent Claims 1 and 12 stand or fall separately; the remaining dependent claims stand or fall with the claim from which each depends."

It is however noted that claim 12 is a dependant calims, rather than an independent claim as indicated by applicant's statement. Claim 12 is dependant on claim 1.

Also, while Appellant's Brief presents arguments directed to rejections based on Golomb, Wunning, and JP-614, no arguments are presented to specifically rebut the Examiner's rejection of:

- Claims 11 and 15 were rejected under section 103(a) over Golomb, Wunning, and JP-614, and further in view of U.S. Patent No. 6,497,098, issued to Griffin et al. ("Griffin").

- Claims 17-19 were rejected under section 103(a) over Golomb, Wunning, JP-614, and Griffin, and further in view of those of U.S. Patent No. 5,636,977, issued to Benson et al. ("Benson").

Appellant argues that the examiner's rejections in the Office Action "... are driven by a hindsight reconstruction of Appellant's own invention using their own specification as a guide, exactly the impermissible hindsight that the U.S. patent jurisprudence, including *KSR,* prohibits. From the beginning of this invention, the inventor, now Appellant, looked to solve the vexing problem of combusting a gas mixture that has extremely low levels of oxidant, while simultaneously combatting the problem of NOx generation. Only she solved this problem with the elegant solution represented by the subject matter recited in Claim 1." Appellant calls upon the text of the present application to support this argument. More specifically, Appellant references paragraph "[0011]" (page 4, line 3) of the original specification which includes at least the following passages restated herein below:

- The invention is based on the general idea of using the flameless combustion, which is known for the reduction of NOx emissions, for the combustion of a nitrogen-free gas mixture.
- The invention uses the knowledge that a combustion method operating with flameless combustion is suitable, in a particular manner, for the combustion of weakly reactive gas mixtures.
- Where a weakly reactive gas mixture is to be burnt, in particular where the oxygen of the gas mixture to be burnt is obtained by means of an oxygen transport membrane with rather large scavenging gas quantity, the output capability of the combustion process operating nitrogen-free can be distinctly improved by the combination, according to the invention, of a combustion process operating nitrogen-free with a flamelessly operating combustion process.
- Such an effect is not to be expected because the known combustion process operating with flameless combustion is used expressly for the reduction of the NOx emissions.

- To this extent, the present invention uses the combustion process operating with flameless combustion for a different purpose.
- This is because the use of the flameless combustion in a combustion process operating nitrogen-free permits reliable and stable combustion of a weakly reactive gas mixture.

However, in response to Appellant's argument (page 13, lines 7-9 of the Brief) that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971). Furthermore, Appellant is reminded that the fact that Appellant has recognized another advantage which would flow naturally from following the suggestion of the prior art cannot be the basis for patentability when the differences would otherwise be obvious. See *Ex parte Obiaya*, 227 USPQ 58, 60 (Bd. Pat. App. & Inter. 1985). Indeed, regarding advantages which would flow naturally from following the suggestion of the prior art, under the Heading "Prior Art" Appellants' own patent application disclosure acknowledges known advantages of flameless combustion while discussing the method for burning fuel in a combustion space is known from EP 0 463 218 A1 (Wunning) which claims priority to European Patent Office Patent application no. 90112392.7. It is noted that the prior art reference of US 5,154,559 (Wunning) relied on in the examiner's Final Rejection also claims priority to European Patent Office Patent application no. 90112392.7. With regard to known advantages of flameless combustion Appellant's application disclosure states the following:

> [0008] A method for burning fuel in a combustion space is known from EP 0 463 218 A 1, in which fuel is oxidized with preferably preheated combustion air in the presence of recirculated combustion exhaust gases. In the case of air combustion, thermal NOx is always formed, the NOx formation increasing strongly with increasing flame

temperature. In order to reduce the NOx emissions, the known process proposes oxidizing the fuel, substantially flamelessly and pulsation-free, with an extremely high level of combustion exhaust gas recirculation system. This is achieved by combustion exhaust gases, from which useful heat has been previously removed to outside the system, being mixed with the preheated combustion air in a combustion exhaust gas recirculation system ratio greater than or equal to 2. In this arrangement, the exhaust gas recirculation system ratio is defined as the ratio between the mass flows of the recirculated combustion exhaust gas and the combustion air supplied, this exhaust gas/air mixture being kept at a temperature which is higher than the ignition temperature, and the exhaust gas/air mixture being then brought together with the fuel so as to form an oxidation zone in which a substantially flameless and pulsation-free oxidation takes place in the combustion space. By means of this known process, the NOx emissions in the case of combustion using air can be reduced by an estimated factor of 10.

From both Appellant's own summary and discussion of EP 0 463 218 A1 (Wunning) (i.e. - US 5,154,559 (Wunning)), and from the reasons stated in the examiner's Final Rejection of the claims based on the teachings of US 5,154,559 (Wunning), it is clear that flameless combustion when used for reducing NOx emissions would at the time of the invention be understood and known to include at least the following characteristics:

- substantially pulsation-free;
- an extremely high level of combustion exhaust gas recirculation system;
- cooled combustion exhaust gases are mixed with the preheated combustion air in a combustion exhaust gas recirculation system ratio $\geq$ 2; and
- NOx emissions in the case of combustion using air can be reduced by an estimated factor of 10.

US 5,154,559 (Wunning) shows:

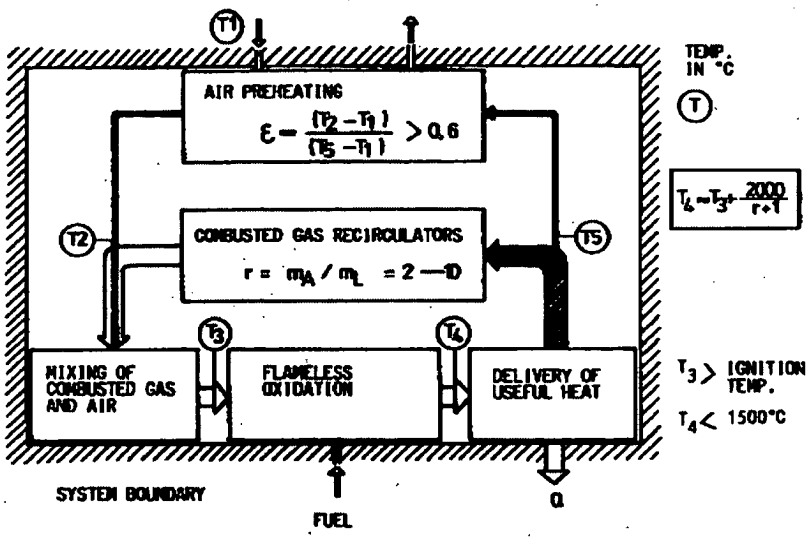

Fig. 1

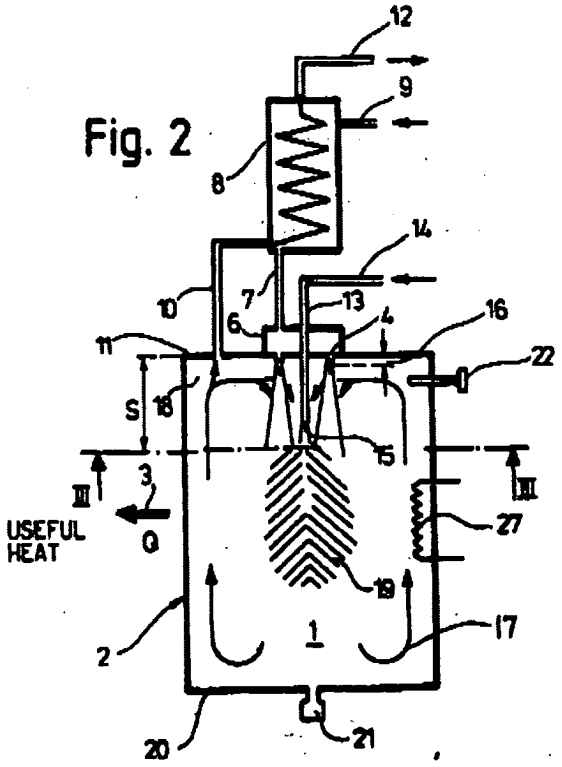

Fig. 2

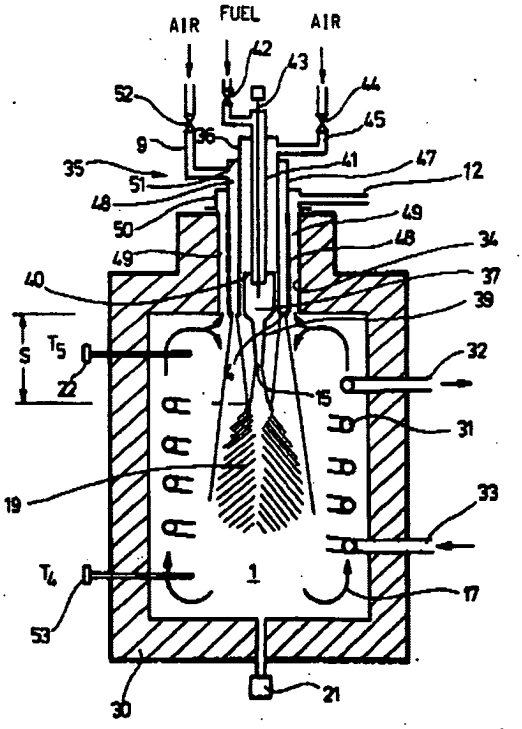

Fig. 4

Based on that which is explicitly taught by US 5,154,559 (Wunning) the examiner can not agree with Appellant's argument that examiner's conclusion of obviousness is based upon improper hindsight reasoning. The Examiner also does not agree with Appellant's suggestion that since US 5,724,805 (Glomb et al) already achieves tremendously low NOx levels a person of ordinary skill in the art would have no reason to look for another way to eliminate NOx production it. On the contrary, a person having ordinary skill in the art at the time of the invention would have understood and know that known combustion processes operating with flameless combustion are indeed not used expressly for the reduction of the NOx emissions, as suggested by Appellant. More specifically, as taught by US 5,154,559 (Wunning) and acknowledged in Appellant's own disclosure and discussion of the known prior art of EP 0 463 218 A1 (Wunning) (i.e. - US 5,154,559 (Wunning)), flameless combustion not only results in NOx emissions also at least predictably and advantageously drastically reduces the noise level in the combustion chamber compared with the noise produced in combustion with flames, because the pressure or pulse fluctuations in the flame front that are definitive for noise production are omitted. Moreover, the fact that the flameless combustion additionally results in advantageously low levels of NOx emissions would have indeed alone suggested to the person having ordinary skill in the art at the time of the invention the use of flameless combustion in combination with a combustion system such as that disclosed in US 5,724,805 (Glomb et al) operating combustion process in a manner also intended reduction of the NOx emissions. In this regard see Figure 1 of US 5,154,559 (Wunning) reproduced herein above and Figures 1 and 4 of US 5,724,805 (Glomb et al) here below.

US 5,724,805 (Glomb) shows:

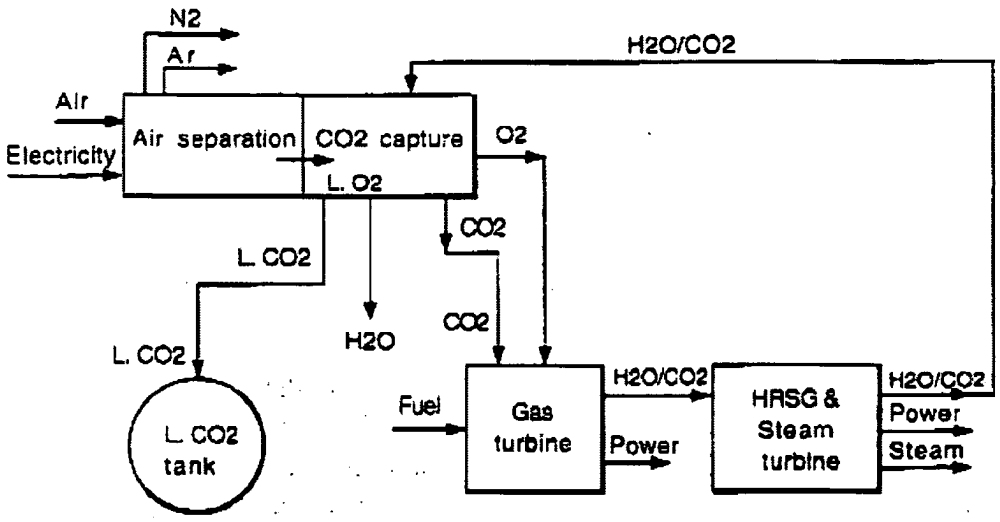

FIG. 1

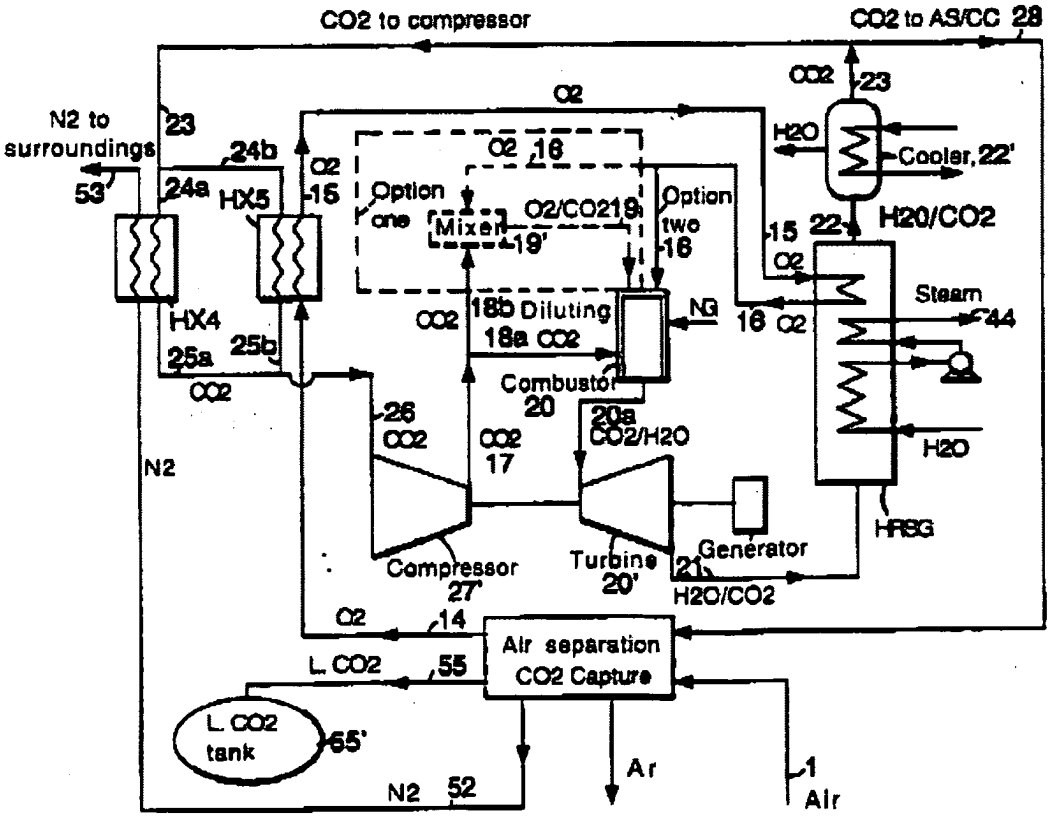

FIG. 4

Indeed, there is nothing in US 5,724,805 (Glomb et al), or US 5,154,559 (Wunning), which would deter the person of ordinary skill from attempting to completely eliminate NOx formation. Furthermore, since both the combustion process of US 5,724,805 (Glomb et al) and the flameless combustion process of US 5,154,559 (Wunning) operate to achieve stable combustion and reduced NOx formation by the shared operating principle of intentionally mixing a heated combustion oxidant with an inert (CO2) recirculated combustion exhaust gas flow further suggests the person having ordinary skill in the art at the time of the invention would expect predictable results by combining the teachings of US 5,724,805 (Glomb et al), or US 5,154,559 (Wunning). Thus, the Examiner maintains position that the rejection of claims under 35 U.S.C. 103(a) as being unpatentable over US005724805 (Glomb et al) in view of US005154599 (Wunning) is proper.

Appellant argues the Examiner's rejection of claims 3, 12, 13, 14, 16, 20, 21, and 25 under 35 U.S.C. 103(a) as being unpatentable over US005724805 (Glomb et al) (of record) in view of US005154599 (Wunning), as applied above, and further in view of JP10-89614 is in error since the examiner's statement "fails to provide any rationale behind the conclusion of obviousness it reaches, and instead is simply conclusory." In support of this argument Appellant notes only that the figures of JP 10-89614 "... instead appear to suggest that the combustion products produced in the lower portion of the U-shaped chamber 3 are drawn backwards through the upper arm, and are directed out of the combustion chamber by the valve 10. Thus, those hot combustion gases, even if additionally heated in the upper portion of the U-shaped combustion chamber, are not exposed to the pre-combustion gases." The Examiner disagrees with both Appellant's suggestion that the Examiner's statement of the rejection lacks a rationale and with Appellant's understanding of the teachings presented in JP 10-89614. In this regard it is noted that the Examiner's statements explicitly directs Appellant's attention to "(see the English language Abstract)" of JP 10-89614 which states the it is advantageous to eliminate use of pilot burner and preheat air to more than spontaneous ignition temperature of fuel in combustion systems operating to enables exhaust gas recirculation. Further in this regard, Appellant's

attention is directed to the following portions of a full text computer generated English language translation of JP 10-89614, available from the Japanese Patent Office internet website:

> "[0014] moreover, said fuel -- and -- or the source of a preheating of a combustion air is characterized by being the combustion-gas sensible heat which burned with the radiant tube. Moreover, it is characterized by arranging the heat-regenerative element to said burner. Moreover, it is characterized by said **air temperature for combustion** which carried out the **preheating being more than the autogenous ignition temperature of a fuel**.".
>
> "[0026] By the way, if the combustion-air rate of flow is made into a high speed, we will be anxious about the relief of a flame, and generating of a flame failure depended for blowing away, **but if** it is the **hot tempered air more** than the **ignition temperature of a fuel**, a **flame failure will not generate** the combustion-air rate of flow in 60 m/s with coke oven gas (it is written as Following COG), either. In this example, in COG, it could burn also at the high speed of 200 m/s, and the upper limit of the combustion-air rate of flow was not able to be checked on the experiment."
>
> "[0036] moreover, a fuel -- and -- or it is the combustion-gas sensible heat in which the source of a **preheating of a combustion air** burned with the radiant tube -- a radiant tube heating system -- total thermal efficiency is made high. Moreover, since adoption of the ceramics becomes easy compared with a metal heat exchanger, thermal resistance improves and energy is made for the elevated-temperature exhaust gas sensible heat to fall with the minimum by arranging to a burner the heat-regenerative element which stores the sensible heat of the combustion gas emitted from a radiant tube, elevated-temperature-ization of the tempered air is enabled. Moreover, by carrying out tempered **air temperature** to **more than** the **autogenous ignition temperature** of a fuel, air will hold the source of oxygen of three elements of combustion, and an ignition source, and it becomes possible to make it burn only by throwing a fuel and the tempered air. **Therefore, the pilot burner which was the need conventionally becomes unnecessary**."

And, as to the Examiner's rational for the suggested combination of the teachings, it is noted that the Examiner's statement of the rejection recites "for at least the purpose of eliminating the use of a pilot burner", it would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify US005724805 (Glomb et al) to preheat the combustible mixture to a temperature greater than the spontaneous ignition temperature, or self-ignition temperature.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

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